

Appendix B
Draft Facility Monitoring Plan

**BATTLE CREEK SALMON AND STEELHEAD
RESTORATION PROJECT**

FACILITY MONITORING PLAN

DRAFT: JUNE 2003

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1. INTRODUCTION

This Facility Monitoring Plan has been developed in accord with the Battle Creek Salmon and Steelhead Restoration Project Memorandum of Understanding (MOU) provisions, specifically Section 7.2 of that document. The focus of this Plan is to monitor compliance with new instream flows and the performance of new fish ladders and fish screens, all of which are elements of the Restoration Project.

This Plan is not to be confused with the Operations and Maintenance Plan developed by U.S. Bureau of Reclamation pertaining to procedures to be used to assure proper functioning of new facilities constructed as part of the Restoration Project. Rather, this Plan is intended to monitor results achieved with those facilities and is intended to be a component of the amended license for FERC Project No. 1121.

2. DEFINITIONS

As this document is derived from the conditions specified in the MOU, all definitions described in Section 2.0 of the MOU apply herein.

3. INSTREAM FLOW

3.1 General Provisions

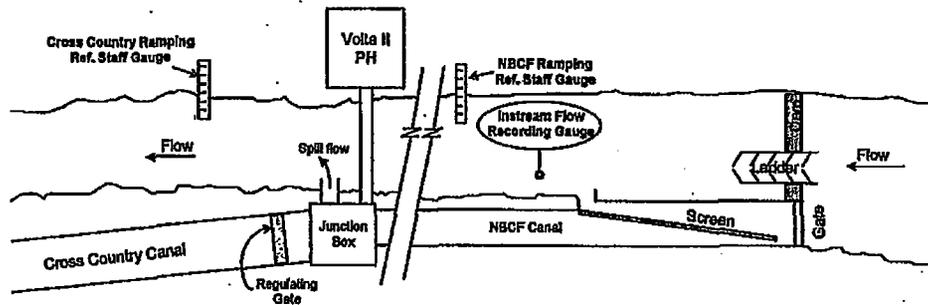
At the various outlet and spillway works for North Battle Creek Feeder, Eagle Canyon, Inskip, and Asbury Pump (Baldwin Creek) Diversion Dams, operate properly calibrated remote sensing devices that continuously measure and record total flow and the fluctuation of stage immediately below each dam during all operations for the purpose of verification of FERC license compliance. All flow and stage recording methodologies shall be approved by FERC.¹

Final flow records to be produced and published as per the provisions for other FERC license compliance monitoring gages on the Battle Creek Project (FERC Project No. 1121). In the absence of final flow records, provisional flow records may be used to meet the documentation needs the Reporting and Notice Requirements (Section 3.6) in a timely manner.

¹MOU 7.2.A

3.2 North Battle Creek Feeder Diversion Dam

North Battle Creek Feeder Diversion
Flow Gauging Diagram



Instream flow to be monitored for minimum flow requirement at a new stream gaging facility installed as part of the Restoration Project modifications to North Battle Creek Feeder Diversion Dam at a location downstream of the fish screen and fish ladder discharge points. The necessary monitoring and recording equipment compatible with other such equipment used by Licensee for this purpose will be installed at the new gage². Records will be produced in the same manner as required for other existing FERC license instream flow monitoring gages.

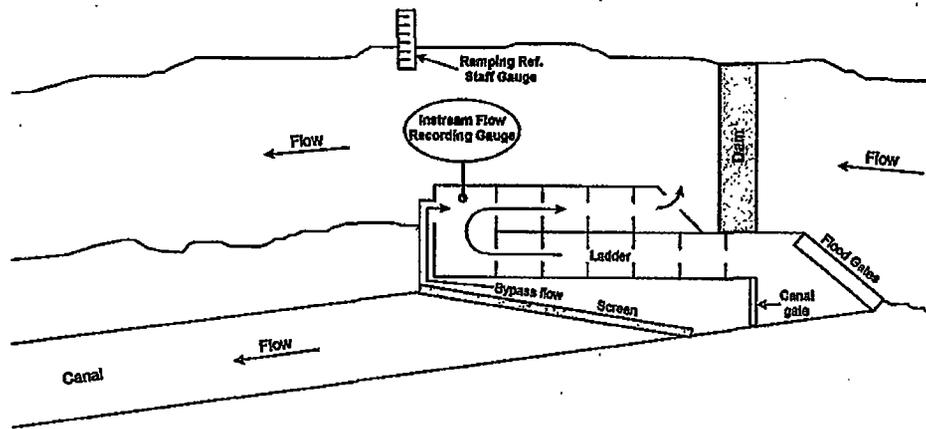
Within the minimum flow requirement range of operation of the gage and up to a maximum of approximately 100 cfs, the stage-discharge relationship will be verified by periodic field measurements in accordance with USGS standards. Personnel cannot safely measure flows in excess of approximately 100 cfs in the stream channel.

The monitoring and recording gage will be equipped to provide input to the diversion regulating gate and alarms to appropriate operating headquarters when flows are at or near the minimum requirement to allow timely response to correct problems as necessary.

² MOU 10.2

3.3 Eagle Canyon Diversion Dam

**Eagle Canyon Diversion
Flow Gauging Diagram**

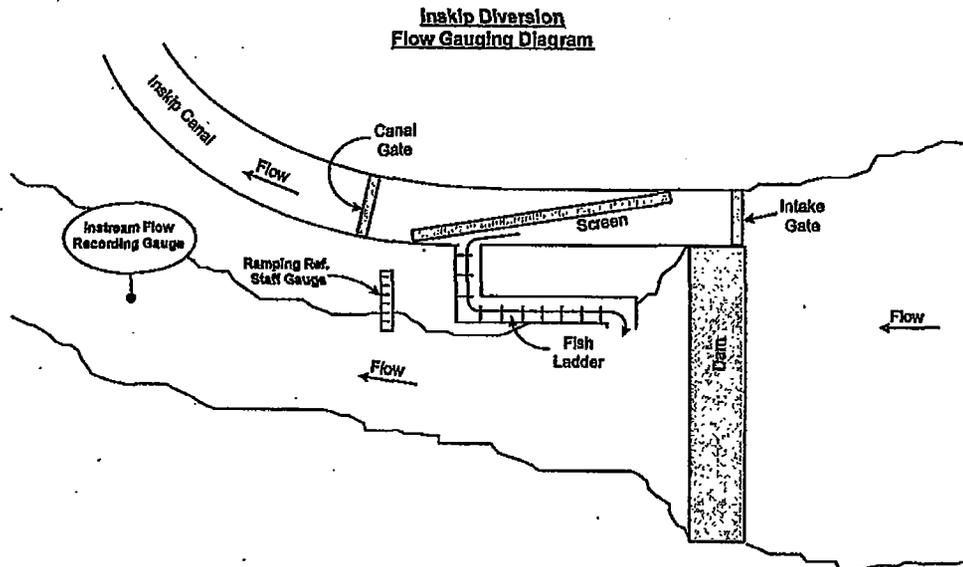


Instream flow at this site is to be monitored for minimum flow requirement in the lower portion of the new fish ladder being installed as part of the Restoration Project modifications to Eagle Canyon Diversion Dam. The necessary monitoring and recording equipment compatible with other such equipment used by Licensee at other monitoring locations for this purpose will be installed at the site³. Records will be produced in the same manner as required for other existing FERC license instream flow monitoring gages. The stage-discharge rating for this gage up to maximum fish ladder capacity will be that derived through prior experimentation and rating of the standard configuration ladder being installed.

The monitoring and recording gage situated in the lower portion of the fish ladder will be equipped to provide input to the canal diversion regulating gate and alarms to appropriate operating headquarters when flows are at or near the minimum requirement to allow timely response to correct problems as necessary. For purposes of compliance with minimum instream flow requirements, the flow contribution from springs released to the stream below the diversion dam is included and this flow combined with that monitored and recorded in the ladder will comprise the instream flow calculation for FERC license purposes.

³ MOU 10.2

3.4 Inskip Diversion Dam



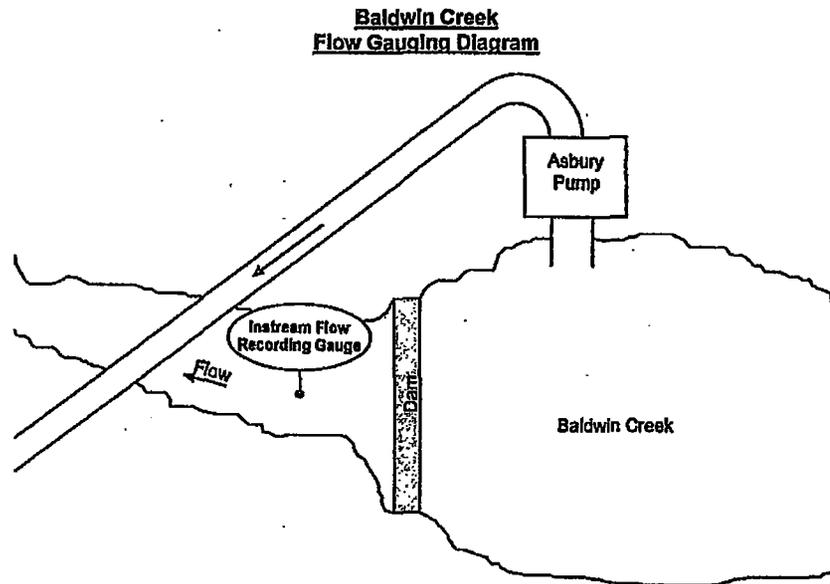
Instream flow to be monitored for minimum flow compliance at the existing stream gaging facility which is situated at a location downstream of the proposed fish screen and fish ladder discharge points. Records will be produced in the same manner as required for other existing FERC instream flow monitoring gages.

Within the minimum flow requirement range of operation of the gage and up to a maximum of approximately 100 cfs, the stage-discharge relationship will be verified by periodic field measurements in accordance with USGS standards when stream conditions allow safe accomplishment of the verification measurements. Personnel cannot safely measure flows in excess of approximately 100 cfs in the stream channel.

The monitoring and recording gage will be equipped to provide input to the canal diversion regulating gate and alarms to appropriate operating headquarters when flows are at or near the minimum requirement to allow timely response to correct problems as necessary⁴.

⁴MOU 10.2

3.5 Baldwin Creek



Instream flow to be monitored for minimum flow compliance at a new stream gaging facility installed as part of the Restoration Plan modifications at a location downstream of the diversion dam. The necessary monitoring and recording equipment compatible with other such equipment used by Licensee for this purpose will be installed at the new gage⁵. Records will be produced in the same manner as required for other existing FERC instream flow monitoring gages.

Within the minimum flow requirement range of operation of the gage and up to a maximum of approximately 25 cfs, the stage-discharge relationship will be verified by periodic field measurements in accordance with USGS standards.

The monitoring and recording gage will be equipped to provide input to the pumping station and alarms to appropriate operating headquarters when flows are at or near the minimum requirement to allow timely response to correct problems as necessary.

3.6 Reporting and Notice Requirements

Licensee will make available all facility monitoring reports to the Resources Agencies (NOAA Fisheries, U.S. Fish and Wildlife Service, and California Department of Fish and Game) and CALFED upon specific request. Upon discovery of any occurrence of operation of a water release mechanism outside of the requisite specifications, notification will be made by Licensee via telephone or other expedient means to the Resource Agencies as soon as possible, but not later than the next day of operation. The notification shall include a description of the

⁵ MOU 10.2

deviation, any necessary corrective measures taken or proposed, and an implementation schedule if the situation has not been corrected.⁶

Normal FERC reporting requirements will be followed for situations where a potential violation of license conditions has occurred.

At any site where inflow to the facility drops below the minimum instream flow requirement, an initial notification of the low flow condition will be made by Licensee to the Resource Agencies. A subsequent notification will be made when inflows have again reached quantities adequate to satisfy the particular minimum instream flow requirement. Continual notification or reporting will not be required during the intervening period while flow is below the prescribed minimum.

4 SPRING FLOWS

4.1 In the Eagle Canyon area, the majority of spring flow formerly collected near the headworks and conveyed to Eagle Canyon Canal was released to the stream in conjunction with an "interim flow agreement" between PG&E and USBR. That release is continued as an element of the Restoration Project. Confirmation that facilities have not been installed to capture this water for conveyance to Eagle Canyon Canal will be provided annually.

4.2 Spring flow may be measured periodically by Licensee to accurately determine its contribution to the instream flow requirement below Eagle Canyon Diversion Dam. Records produced to demonstrate compliance with the instream flow requirement will reflect the most accurate estimate of the contribution from springs.

5. RAMPING RATES

5.1 General Provisions

When returning the water conveyance facilities listed below to service, following forced or scheduled outages where the available diversion flow has been released to the natural stream channel, the maximum rate at which water is diverted from the stream channel back into the conveyance system shall not exceed 0.10 ft./hr. reduction in the stage in the natural channel.⁷ This restriction shall not apply above threshold flows at each location as determined in the field by consensus of the Resource Agencies and Licensee.

⁶ MOU 7.5

⁷ MOU Attachment 2

North Battle Creek Feeder
Cross-Country Canal
Eagle Canyon Canal
Inskip Canal
Coleman Canal

Monitoring of stream stage for ramping purposes will be at a confined, (i.e., narrow) stream transect immediately below the diversion point for the conveyance facility being returned to service, or at another appropriate location at the facility if a suitable transect is not available immediately below the diversion point.⁸

5.2 North Battle Creek Feeder

A readily-observable staff gage will be installed in a secure location in the natural stream channel downstream of the North Battle Creek Feeder Diversion Dam as part of the modifications to facility.⁹ Personnel will observe and log stage readings from this staff gage during ramping operations.

As an alternate, the staff gage serving as a ramping reference point for Cross-Country Canal in Section 5.3 below may be used to perform this function for North Battle Creek Feeder.

5.3 Cross-Country Canal

A readily-observable staff gage will be installed in a secure location in the natural stream channel downstream of the North Battle Creek Feeder/Cross-Country Canal junction facility as part of the modifications to the North Battle Creek Feeder facility.¹⁰ Personnel will observe and log stage readings from this staff gage during ramping operations.

5.4 Eagle Canyon Canal

A readily-observable staff gage will be installed in a secure location in the natural stream channel downstream of the Eagle Canyon diversion facility as part of the modifications to the this site.¹¹ Personnel will observe and log stage readings from this staff gage during ramping operations.

⁸ MOU Attachment 2

⁹ MOU 10.2

¹⁰ MOU 10.2

¹¹ MOU 10.2

5.5 Inskip Canal

A readily-observable staff gage will be installed in a secure location in the natural stream channel downstream of Inskip Diversion as part of the modifications to the facility.¹² Personnel will observe and log stage readings from this staff gage during ramping operations.

5.6 Coleman Canal

A readily-observable staff gage will be installed in a secure location in the natural stream channel downstream of the Coleman Canal intake works as part of the modifications to the this site¹³. Personnel will observe and log stage readings from this staff gage during ramping operations.

5.7 Reporting and Notice Requirements

Licensee will make available all facility monitoring reports to the Resources Agencies and CALFED upon specific request. Upon discovery of any occurrence of operation of a water release mechanism outside of the requisite specifications, notification will be made by Licensee to the Resource Agencies as soon as possible, but not later than the next day of operation. The notification shall include a description of the deviation, any necessary corrective measures taken or proposed, and an implementation schedule if the situation has not been corrected.¹⁴

Normal FERC reporting requirements will be followed for situations where a potential violation of license conditions has occurred.

6. FISH LADDER OPERATION

6.1 General Provisions

At the fish ladders at North Battle Creek Feeder, Eagle Canyon, and Inskip Diversion Dams, operate properly calibrated remote sensing devices that continuously monitor water surface elevations at the top and bottom of the ladder to identify debris problems.¹⁵ One water level sensor will be installed at an appropriate location near the upstream end of the new fish ladder and another near the downstream end. The sensors will be monitored by automated equipment to detect occurrence of an abnormal water level or abnormal water level differential and provide an alarm to appropriate operating headquarters to allow timely response to the suspect condition.

¹² MOU 10.2

¹³ MOU 10.2.

¹⁴ MOU 7.5

¹⁵ MOU 7.2.B

The sensors, monitoring equipment, and alarm system will be included as part of the construction of the new fish ladders¹⁶. The magnitude of the differential requiring an alarm will be determined at each specific location during startup testing of the new fish ladder through consensus of the Resource Agencies and Licensee and may be modified from time to time by consensus as operational experience is gained.

6.2 Reporting and Notice Requirements

Licensee will make available all facility monitoring reports to the Resources Agencies and CALFED upon specific request. Upon discovery of any occurrence of operation of a ladder outside of the requisite specifications, notification will be made by Licensee to the Resource Agencies as soon as possible, but not later than the next day of operation. The notification shall include a description of the deviation, any necessary corrective measures taken or proposed, and an implementation schedule if the situation has not been corrected.¹⁷

Normal FERC reporting requirements will be followed regarding fish ladder outages, alarms, or operational deviations.¹⁸

7. FISH LADDER USE

7.1 General Provisions

Operate a calibrated automated fish counter or an underwater video camera to document fish movement through the ladder during the initial three-year period of operation, or as otherwise agreed by the Resource Agencies and Licensee as provided in the terms of the MOU.¹⁹ The design and construction of the new fish ladders at North Battle Creek Feeder, Eagle Canyon, and Inskip Diversion Dams will incorporate the provisions for the required monitoring equipment and that equipment will be installed as part of the facility modifications²⁰. Equipment to be used will be specified by the Adaptive Management Policy Team and will be suited to the particular conditions at each site.

Operating personnel to note any congregations of fish below the fish ladders and fish passing up the ladder during routine visits to service the site.²¹

¹⁶ MOU 10.2

¹⁷ MOU 7.5

¹⁸ AIP footnote 1

¹⁹ MOU 7.2.B (Modified to note "Resource Agencies" rather than "Parties" for this document.)

²⁰ MOU 10.2

²¹ AIP footnote 1

7.2 Reporting and Notice Requirements

The fish use records at the fish ladders will be made available on a monthly basis to the Resource Agencies during the initial three-year period of operation, or as otherwise agreed upon by the Resource Agencies and Licensee.²² Observation of any congregations of fish below the fish ladders will be reported by Licensee to the Resource Agencies as soon as possible, but not later than the next day of operation.

8. FISH SCREEN OPERATION AND MAINTENANCE

8.1 General Provisions

At the fish screens at North Battle Creek Feeder, Eagle Canyon, and Inskip Diversion Dams, operate properly calibrated remote sensing devices that continuously monitor water surface elevation differences on the inlet and outlet sides of screens to identify plugging.²³ One water level sensor will be installed at an appropriate location near the inlet side the new fish screen and another near the outlet side. The sensors will be monitored by automated equipment to (1) detect occurrence of an abnormal water level or water level differential, (2) automatically close the associated canal diversion gate when critical water level differential is exceeded, and (3) provide an alarm to appropriate operating headquarters to allow timely response to the suspect condition and closure of the associated canal intake gate when critical differential is exceeded.

The sensors, monitoring equipment, alarms, and control system will be included as part of the construction of the new fish screens²⁴. The magnitude of the water level differential requiring initiation of canal intake gate closure will be determined at each specific location during startup testing of the new fish screen through consensus of the Resource Agencies and Licensee and may be modified from time to time by consensus as further operational experience is gained.

The fish screen operating and control systems will also incorporate alarms to indicate occurrence of electrical and/or mechanical malfunctions. Alarms initiated for these purposes will be transmitted to appropriate operating headquarters to allow timely response to the suspect condition.

Annual inspections of the fish screens will be made consistent with the long-term operations and maintenance plan recommendations of the Central Project Valley Improvement Act Anadromous Fish Screen Program to verify no gaps exceeding

²² MOU 7.5 (Modified to note "Resource Agencies" rather than "Parties" for this document.)

²³ MOU 7.2.C

²⁴ MOU 10.2

design criteria exist in the structure, verify the screen is being properly maintained, and that site conditions have not significantly changed.²⁵

8.2 Reporting and Notice Requirements

Licensee will make available all facility monitoring reports to the Resources Agencies and CALFED upon specific request. Upon discovery of any occurrence of operation of a fish screen outside of the requisite specifications, notification will be made by Licensee to the Resource Agencies as soon as possible, but not later than the next day of operation. The notification shall include a description of the deviation, any necessary corrective measures taken or proposed, and an implementation schedule if the situation has not been corrected.²⁶

Normal FERC reporting requirements will be followed regarding fish screen outages, alarms, or operational deviations.²⁷ Reports of inspections made pursuant to Section 6.1 above will be made available annually to Resource Agencies and FERC.

9. OPERATION OF WASTE GATES, OVERPOURS, AND SPILLWAYS

9.1 Licensee will record the operation of water conveyance facility features used to release water from the conveyance. The use of such facilities is primarily for dewatering the conveyance for maintenance or to release excess water in the case of emergencies. Planned maintenance requiring dewatering of North Battle Creek Feeder, Cross-Country Canal, Eagle Canyon Canal, and Inskip Canal will be scheduled during the period of February 1 through April 30. Planned maintenance of the Coleman Canal will be scheduled upon consultation with the agencies and the Coleman National Fish Hatchery.

9.2 Records of releases from the water conveyance facilities will include time and duration of the release and the estimated flow. The information will be included as part of the annual report of facility operation.

10. CATASTROPHES

10.1 In addition to FERC notification requirements, catastrophic failure of any FERC Project 1121 feature that jeopardizes the Restoration Project objectives will be reported to the Resource Agencies as soon as possible, but not later than the next day of operation.

²⁵ AIP footnote 1

²⁶ MOU 7.5

²⁷ AIP footnote 1

10.2 The Licensee will consult with the Resource Agencies and FERC in the event of a catastrophic failure to assess impacts and formulate appropriate responses to the situation.

11. REPORTING SUMMARY

11.1 Resource Agencies will be notified of:

- **Water release mechanism outside of requisite specifications (3.6, 5.7).**
- **Instream flow below requirement (3.6).**
- **Fish ladder operation outside of requisite specifications (6.2).**
- **Fish congregating at ladders (7.2).**
- **Fish screen operation outside of requisite specifications (8.2).**
- **Catastrophic failure of features jeopardizing Restoration Project objectives (10.1).**

11.2 Fish ladder use

During the first three years of operation, or as otherwise agreed upon by the Resource Agencies and the Licensee, monthly reports of fish ladder usage will be made available to the Resource Agencies (7.2).

11.3 Annual Facility Monitoring Report

The annual Facility Monitoring Report will include:

- **Final instream flow records**
- **Documentation of ramping when returning conveyance facilities to service**
- **Report of waste gate and spillway operations**
- **Report of fish ladder operation**
- **Report of fish screen operation**
- **Confirmation of Eagle Canyon springs release to creek**

**BATTLE CREEK SALMON AND STEELHEAD
RESTORATION PROJECT**

FACILITY MONITORING PLAN

TABLE OF GENERAL PROVISIONS

ITEM	MOU REF.	REQUIREMENT	MONITORING METHOD	DEVICE OR FACILITY	REPORTING	REMARKS
Instream Flow - General provisions	6.1.D, F, M, 7.2.A, 7.5	Continuously monitor, record total flow and fluctuation of stage; methodology approved by FERC.	Gage monitoring & recording equipment as used at other typical FERC instream flow license requirement monitoring points.	(See below for specifics.)	Report flows below minimum to NMFS and CDFG as soon as possible, no later than next day of operation. Report deviations to FERC in accord with existing requirements pertaining to potential license condition violations.	(See below for specifics.)
• NBC Feeder				New gage installation in stream channel below dam, fish ladder, and fishscreen bypass discharge. Alarm point on low flow condition at or near minimum instream flow stage.		Rating for high flows will not be verifiable due to channel conditions. In order to achieve stable and accurate monitoring, some sort of fish-friendly low weir or other artificial control structure may be required.

ITEM	MOU REF.	REQUIREMENT	MONITORING METHOD	DEVICE OR FACILITY	REPORTING	REMARKS
<ul style="list-style-type: none"> Eagle Canyon 				<p>Use pool in the downstream section of the fish ladder as a rated weir if acceptable to USGS and FERC to monitor fishwater requirement. Alarm point on low flow condition at or near minimum instream flow stage. High flows not contained within the ladder would be detected at the DWR stream gage downstream at the Wildcat Road bridge.</p>		<p>Rating for high flows passing will not be verifiable due to channel conditions. Minimum instream flow through ladder will be 10 cfs less than table due to springs being released to creek downstream of the diversion. May want to consider a downstream site such as the existing Wildcat gage where spring flow, fishwater release, and spill flow information can all be obtained.</p>
<ul style="list-style-type: none"> Inskip 				<p>Use existing instream flow gage situated downstream of new ladder discharge area. Alarm point on low flow condition at or near minimum instream flow stage.</p>		<p>Rating for high flows passing will not be verifiable unless a measuring cableway is also installed at some suitable location.</p>

ITEM	MOU REF.	REQUIREMENT	MONITORING METHOD	DEVICE OR FACILITY	REPORTING	REMARKS
<ul style="list-style-type: none"> Asbury Pump 				<p>New gage facility installed in Baldwin Ck. downstream of Asbury Pump diversion dam. Alarm point on low flow condition at or near minimum instream flow stage.</p>		<p>Anticipate flows being measurable to approximately 50 cfs. Proposed structure may be in the form of a standard weir section with a known rating.</p>
<p>Ramping - General Provisions</p>	<p>Att. 2, 7.5</p>	<p>Do not exceed stage reduction rate of 0.1 ft/hr upon returning specified water conveyance facilities to service except as otherwise provided by threshold flow criteria.</p>	<p>(See below for specifics.)</p>	<p>(See below for specifics.)</p>	<p>Report ramping rates in excess of limit to NMFS and CDFG as soon as possible, no later than next day of operation. Report deviations to FERC in accord with existing requirements pertaining to potential license condition violations.</p>	<p>Threshold flow limitations to be determined prior to submittal of proposed FERC license amendment. 90-day time frame originally proposed in MOU was not feasible due to commitments of the Parties at the time. Other opportunities for analysis will be pursued to meet the spirit of the original provision.</p>
<ul style="list-style-type: none"> NBC Feeder 			<p>Observation of staff gage in natural channel downstream of the canal intake facility. Record readings via logging procedure during ramping operation.</p>	<p>Staff gage installed in a secure, representative location in the natural channel</p>		<p>Need gage stage output readily available to operating personnel for reference during ramping procedure.</p>

ITEM	MOU REF.	REQUIREMENT	MONITORING METHOD	DEVICE OR FACILITY	REPORTING	REMARKS
• Cross-Country Canal			Observation of staff gage in natural channel downstream of the flume #1 intake facility. Record readings via logging procedure during ramping operation.	Staff gage installed in a secure, representative location in the natural channel.		Staff location needs to be readily visible to the operating personnel and near the flow control works where regulation will be occurring.
• Eagle Canyon Canal			Observation of staff gage in natural channel downstream of the canal intake facility. Record readings via logging procedure during ramping operation.	Staff gage installed in a secure, representative location in the natural channel.		Need gage stage output readily available to operating personnel for reference during ramping procedure.
• Inskip Canal			Observation of staff gage in natural channel downstream of the canal intake facility. Record readings via logging procedure during ramping operation.	Staff gage installed in a secure, representative location in the natural channel.		Need gage stage output readily available to operating personnel for reference during ramping procedure.
• Coleman Canal			Observation of staff gage in natural channel downstream of the canal intake facility. Record readings via logging procedure during ramping operation.	Staff gage installed in a secure, representative location in the natural channel.		Staff location needs to be readily visible to the operating personnel and near the flow control works where regulation will be occurring.

ITEM	MOU REF.	REQUIREMENT	MONITORING METHOD	DEVICE OR FACILITY	REPORTING	REMARKS
Fish ladder Hydraulic Operation	7.2.B, 7.5	Continuously monitor water surface elevations at top and bottom of the ladder	Water level monitoring equipment installed in two selected locations near the top and bottom of the ladder.	Water level sensors installed as part of ladder construction. Logic circuitry to detect abnormal differential between sensing point with remote alarms transmitted to operating headquarters and switching center.	Report operation outside of requisite parameters to NMFS and CDFG as soon as possible, no later than next day of operation. Report deviations to FERC.	Sensor installations need be compatible with fish ladder geometry, not exposed to damage by debris, and not a source of interference with fish movement.
Fish ladder Use	7.2.B, 7.5, AIP foot-note 1	<ol style="list-style-type: none"> 1. Continuously operate an automated counter or video camera to document fish movement through ladder for the first three years of initial operation. 2. Operating personnel to note any fish stacking below the fish ladder and fish passing up the ladder. 	<ol style="list-style-type: none"> 1. Automated counter or video equipment to be determined by AMIT as appropriate for each of the three ladder sites. 2. Visual observation and logging during routine visits. 	Install physical provisions and monitoring equipment as part of the new ladder construction.	<ol style="list-style-type: none"> 1. Report fish use records monthly to Resource Agencies. Report monitoring equipment failure to NMFS and CDFG as soon as possible, no later than next day of operation. 2. Report observed fish stacking to NMFS and CDFG as soon as possible, no later than next day of operation. 	Equipment failure notification not a specific MOU requirement.

ITEM	MOU REF.	REQUIREMENT	MONITORING METHOD	DEVICE OR FACILITY	REPORTING	REMARKS
Fishscreen Operation	7.2C, 7.5	Continuously monitor water surface elevations on the inlet and outlet sides of the screen.	Water level monitoring equipment installed in two selected locations in the inlet and outlet areas of the screen.	Water level sensors installed as part of screen construction. Logic circuitry to detect abnormal differential between sensing point with remote alarms transmitted to operating headquarters and switching center. Canal intake gate control scheme to shut down canal and send alarm upon detection of water level differential exceeding "fail-safe" criteria for the screen.	Report operation outside of requisite parameters to NMFS and CDFG as soon as possible, no later than next day of operation. Report deviations to FERC.	Sensor installations need be compatible with fishscreen geometry, not exposed to damage by debris, and not a source of interference water flow.